UnRS AL8X AL80B/AL800/AL572 T-R Relay System

4 Jan 2026 rev 0a

This instruction set is applicable to the Ameritron AL80B, AL800(H), and AL572. This amplifier family, known as the AL8X frame series, shares a common power supply board layout. With that board they also share common transmit-receive (T-R) relay systems.

The original T-R relay was from Chicago-based Relay Services Company (RSC). This open frame relay consisted of a standard DPDT outer contact pair with a single-pole normally-open (NO) bias contact in the center. The center normally closed (NC) pole was eliminated to increase spring tension and the resulting wiping action on the receive path contacts. The DPDT armature pair had two flying armature leads for antenna and for radio RF paths, while all other connections are via eight base pins. Relay contacts were large-button gold-flashed contacts. Gold is superior to silver at low currents and voltages. The relay coil was a standard 120-ohm, 12-volt, 100-mA, 1.2-watt coil. Worst case switching time, including bounce settling, was typically 12-14 mS. In figure 1 the yellow trace is control jack signal, aqua is transmit output contacts, and red is the input connection contact time for TX. Low signal indicates transmit mode. This is the worst case hit of a few hundred hit sample:

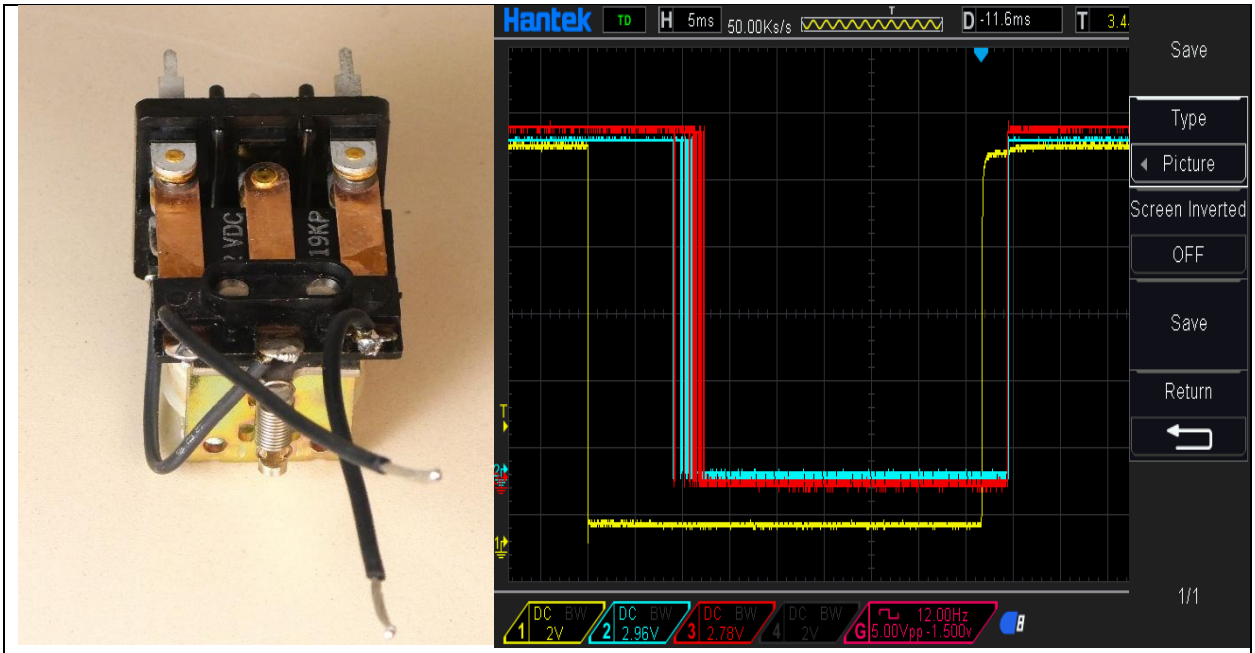


Figure 1 RSC 12Vdc relay TX timing

The gold-plated contacts, absent things like lightning or repeated hot switching damage, have a very long life. **Never file, sand, or burnish the gold flashed contacts.**

In mild cases, a wet hard paper lubricated with a wetting cleaner can be drawn between the receive path buttons and the armature. The contacts can be flushed with a drying no-residue cleaner. The gold-flashed contacts must only have tarnish removed and run dry. They must not be abraded by sanding, filing, or burnishing.

In severe cases the buttons can be cleaned with a small soft brush wetted with a bit of Tarn-X, then flushed with a drying cleaner like common CRC automotive sensor-safe electronic cleaner. (This is a dry run style contact.) The low-abrasion side of a cleaner-wetted standard ink eraser can also be used to gently polish contacts. If a proper cleaning method does not restore the contacts, the relay must be replaced.

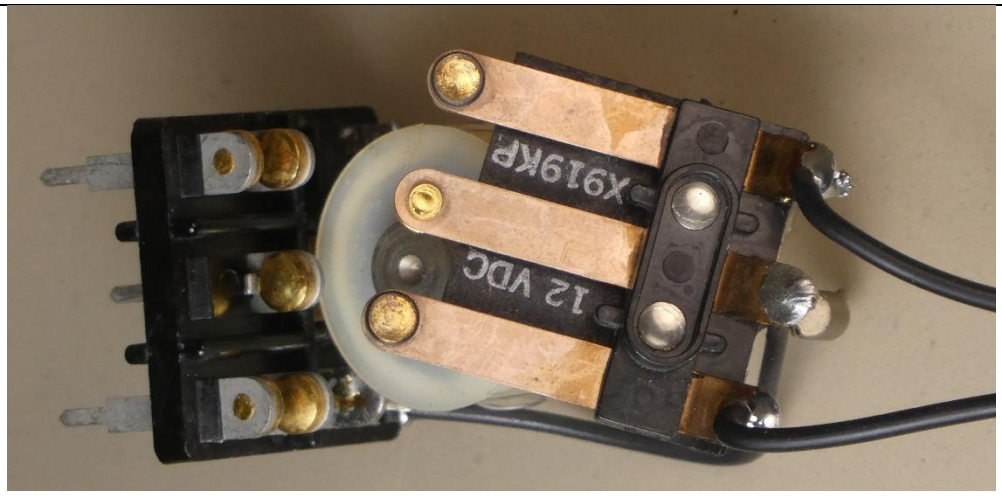


Figure 2 RSC X919KP gold-flashed contacts. Do not damage the thin gold layer.

As of 1995, this relay was out of production. I purchased all relays available during the last run. My stock was depleted in mid-year 2025.

The AL8X frame used three relay layouts, two layouts using this RSC open frame relay. The early layout was a standard T-R layout, later using an X-path layout that paralleled RF receive poles. ***The X layout relocated the circuit board RF input and RF output pads.***

When the RSC relay was going obsolete MFJ changed to an enclosed dual relay system on a plug-in board. CTR Engineering can supply direct fit replacements for this plug-in board. Be aware the factory-original dual enclosed relays have a major timing and sensitivity issue that should be corrected. We offer an ***AL8X kit*** to correct the major factory defects. The original MFJ circuit makes receive less reliable and delays the input and bias far too long.

This instruction set is for converting the open frame relays to a dual relay system. This is

kit number **UnRS-AL8X**. This system is the only properly sequenced system on the market, despite some non-sequenced systems wrongly claiming to be sequenced. The typical **UnRS-AL8X** switching time is 8 mS. The high-power side contacts are always closed and settled before the input side closes. Use 8-10 mS TX delay with this system.

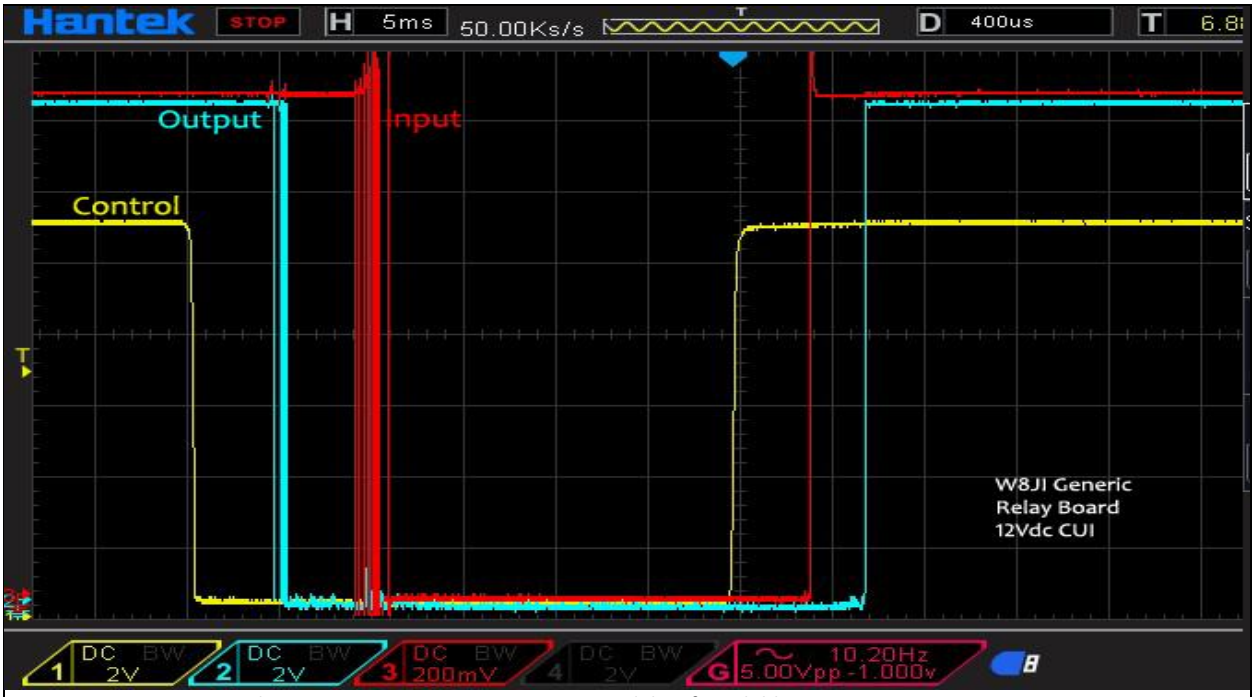


Figure 3 Worst case 100 hit timing UnRS-AL8X. Use 8-10mS TX delay if available.

UnRS AL8X Installation

The UnRS-AL8x is a single-board time-sequenced 12Vdc relay system. It uses a pair of 5Vdc relays along with a unique sequencing circuit that applies constant lower voltage across the slow-close fast-open bias and input relay and constant current to the fast-close, delay-open output relay. Unlike boards claiming to be sequenced that are not, this board is sequenced. Sequencing is important because it inhibits bandswitch damage. The antenna is always connected before the input relay activates the amplifier, and is never disconnected until after the input and TX bias contacts have dropped.

This board must use the original test-selected components.

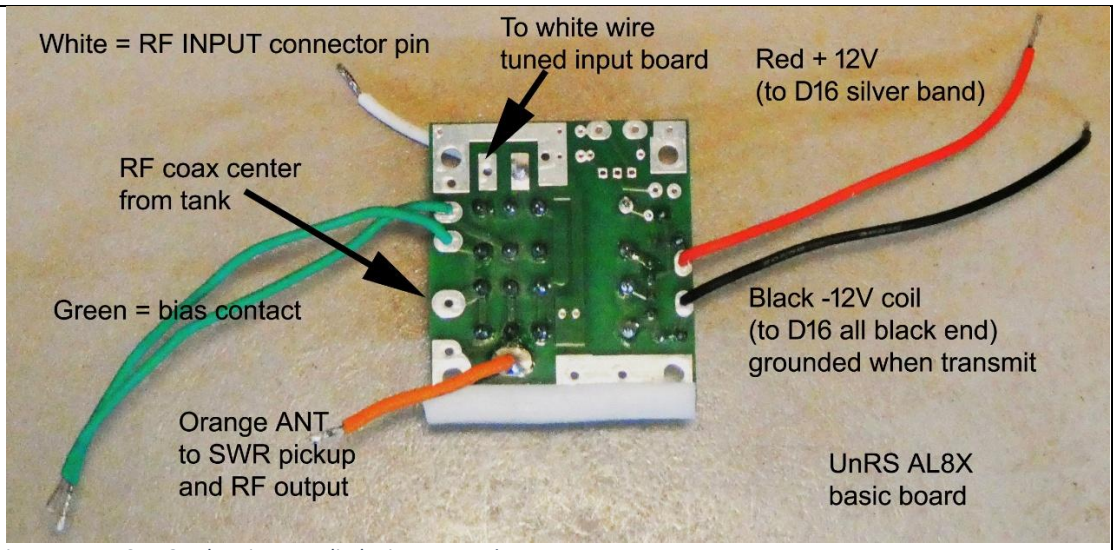


Figure 4 UnRS-AL8X showing supplied wire connections

Move the amplifier to a clear well-lit bench. You will need common electronics hand tools like small and large pliers and wire cutters, perhaps a small drill and small drill bits, soldering tools, and normal hand tools. You will need some type of desoldering tool or desoldering aid, such as solder wick or a solder sucker. Solder must be removed from some solder pad holes.

1.) Remove the old relay. Unsoldering all the pins at the same time is a monumental task. It can only be done with good solder wick or a vacuum-type solder suction device. It is safer, faster, and easier to cut and break the old relay apart in stages.

Take care to not damage the amplifier's circuit board while removing the old factory relay! Work a bit at a time.

Lift up on the wired end of the relay armature (stretching the spring with the pull) and slide the relay armature back out from between the stationary contacts. Discard the armature by cutting the wires.

The relay, prior to cutting or breaking the black base apart, should look like this:

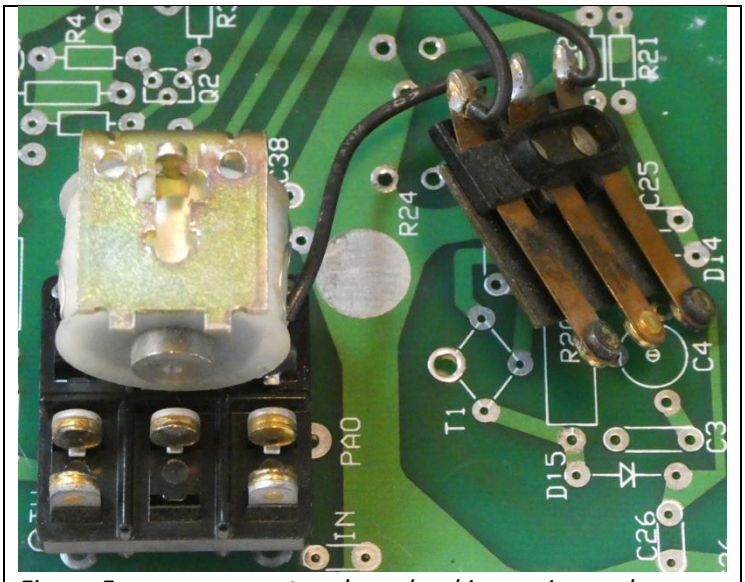


Figure 5 remove armature by unhooking spring end

2.) With the armature out of the way, break the relay's black Bakelite base insulator apart. Nip away at the Bakelite base with heavy sharp wire cutters. The base can also be drilled apart with a sharp small bit and drill. Multiple holes make the hard base easier to break apart. Slightly wiggle and twist base contacts with needle nose pliers to aid breaking.

3.) The violet wire (figure 14) to the tuned input board remains attached. If your amplifier does not have that violet bias trigger wire from the tuned input switch you will have to update it or somehow route TX RF to the bias detector circuit.

4.) Unsolder the small white wire end (figure 14) from the tuned input at the main board. It must remain attached to the tuned input board. Unsolder it, do not cut it.

5.) Unsolder and remove band switch to relay coax where the coax shield and center connect to the main board near the relay. Unsolder it, do not cut it.

6.) Cut and unsolder the relay armature wires and fully remove any wire from the RADIO (RF input) connector.

7.) Eventually, you should have this:

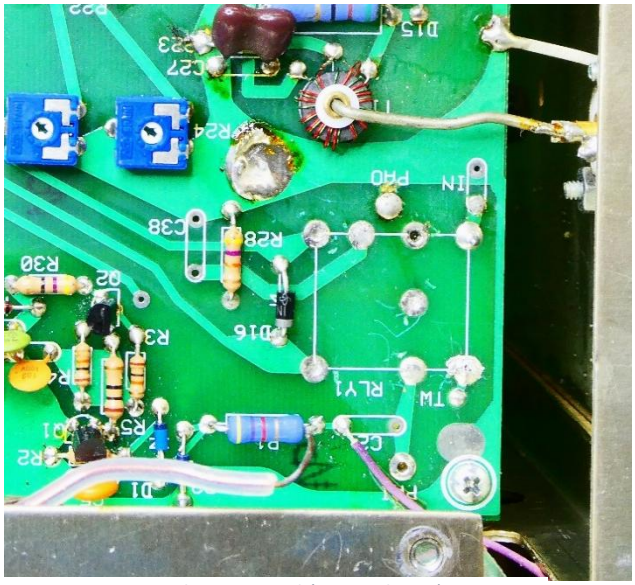
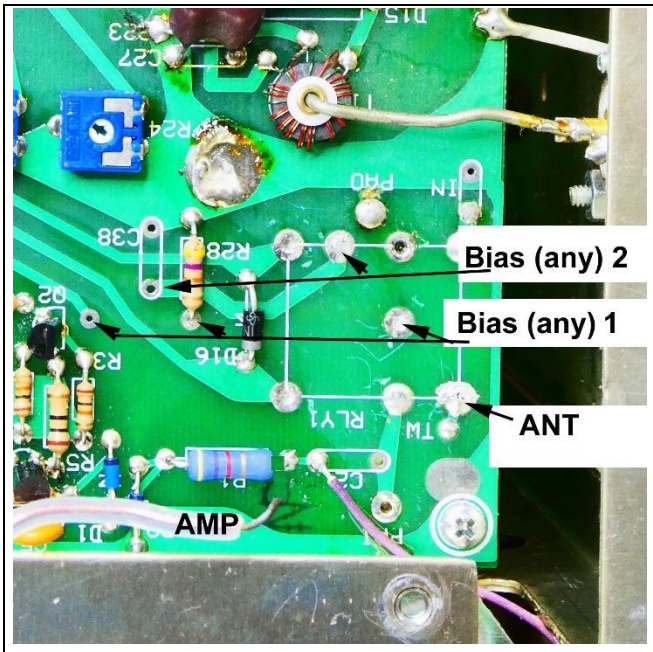


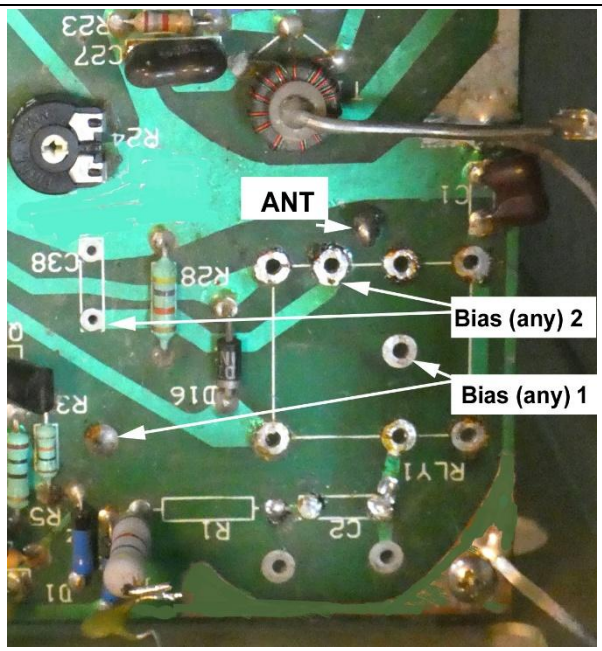
Figure 6 step 7 relay removed (coax is loose)

The 12 Vdc + and - control pads, two bias pads, and RF antenna output pads on the amplifier mother board are used for connections. These five points are the only mother board pads used from the original eight. Four other direct wire connections are the orange RF output, OEM tank circuit coax, a large white RF IN wire, and a small OEM white wire from the tuned input board.

NOTE: ***The RF input and output pole connections reverse or flip their sides on the relay between early and middle production AL8X series amplifiers! The UnRS antenna board "ANT" pad's orange wire must connect to the mother board pad connecting to the RF OUT connector center pin. All other wires stay the same. The EBS sample point (violet wire) may have to change in older amplifiers. The EBS works better tapped off the tube side of the input switch, although our AL8X kit bias mod mitigates this issue.***

Figure 7 shows the bias and RF antenna output pad locations (the RF output may be on the opposite pole in some very early units). You can verify this with an ohmmeter.





Later Board ANT is 0 ohm to RF OUT pin Early Board ANT is 0 ohm to RF OUT pin

Green wires are bias. There are two bias connection pads usable for bias wire 1 and 2.

Figure 7 ANT to RF OUT moves depending on production year!!

8.) The new UnRS AL8X board (figure 4) comes with the heavy orange RF output connector/ SWR coupler wire long enough to reach either output point. Verify the correct orange wire attachment point on the main amplifier circuit board by using an ohmmeter continuity test. Keep the orange lead as shipped to you. The installed wires should be perfectly good just as shipped. Longer leads tend to increase the bypass SWR through the amplifier.

The UnRS-AL8X mounts with relays toward the back panel in this location. Be sure this area is clean, clear, and the center panel 6-32 machine screw just barely extends through the PEM nut on the center panel flange. A long screw may interfere with seating the mounting tape or even worse contact components on the relay board. In figure 8, we used a black screw to illustrate the maximum screw pass-through preferred. Be sure this area is clean before applying tape.

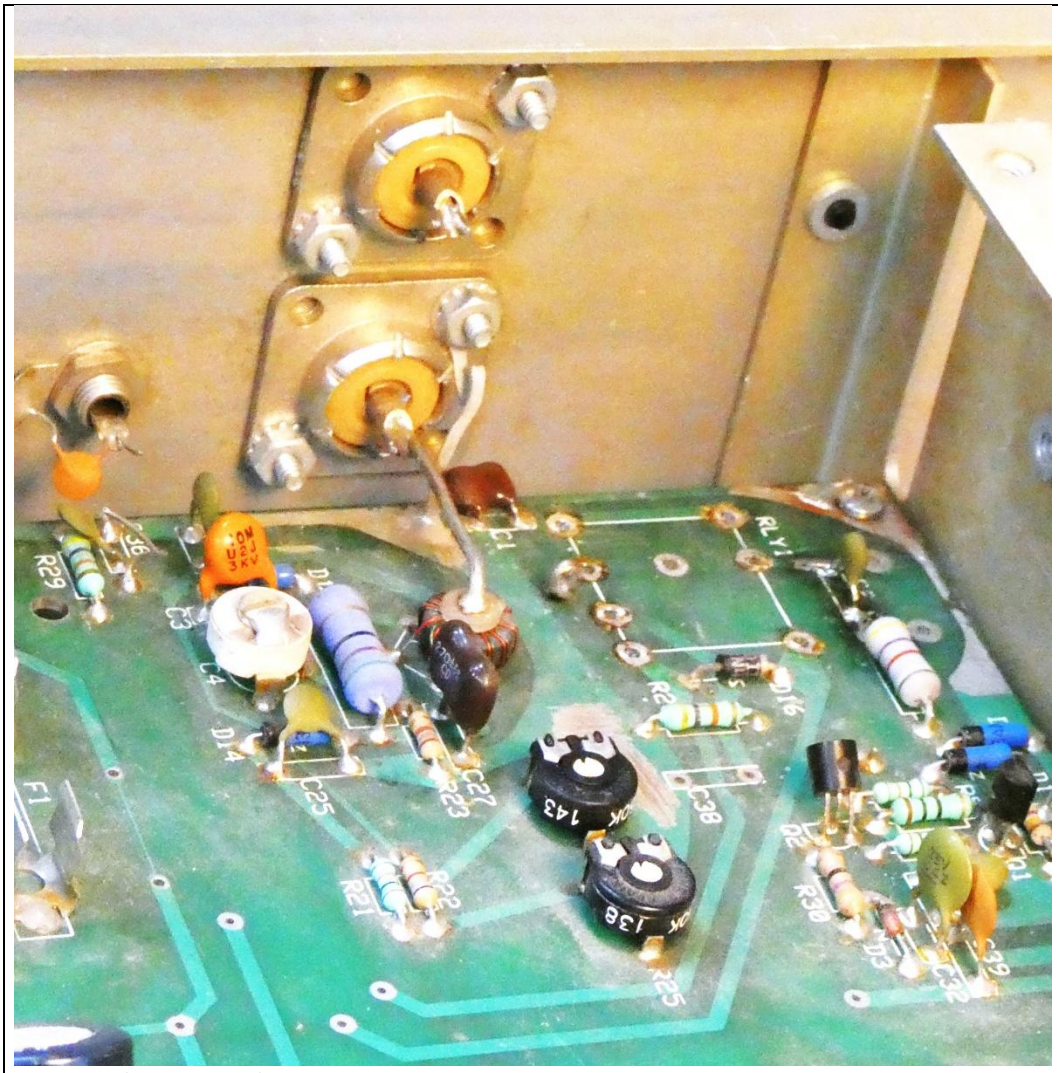


Figure 8 relay mounting location

The relay board is held by thick long-life 3M tape against the relays. This very strong thick 3M tape provides some sound deadening. Peel one tape side and press that side firmly in place against the chassis. Be sure to get the tape edge over the chassis screw and press nut. Do not uncover the outer tape side, leave the 3M protective cover on.

Remember, once the relay board is pushed against the bare tape, it will stay locked in place. It will not be easily movable.

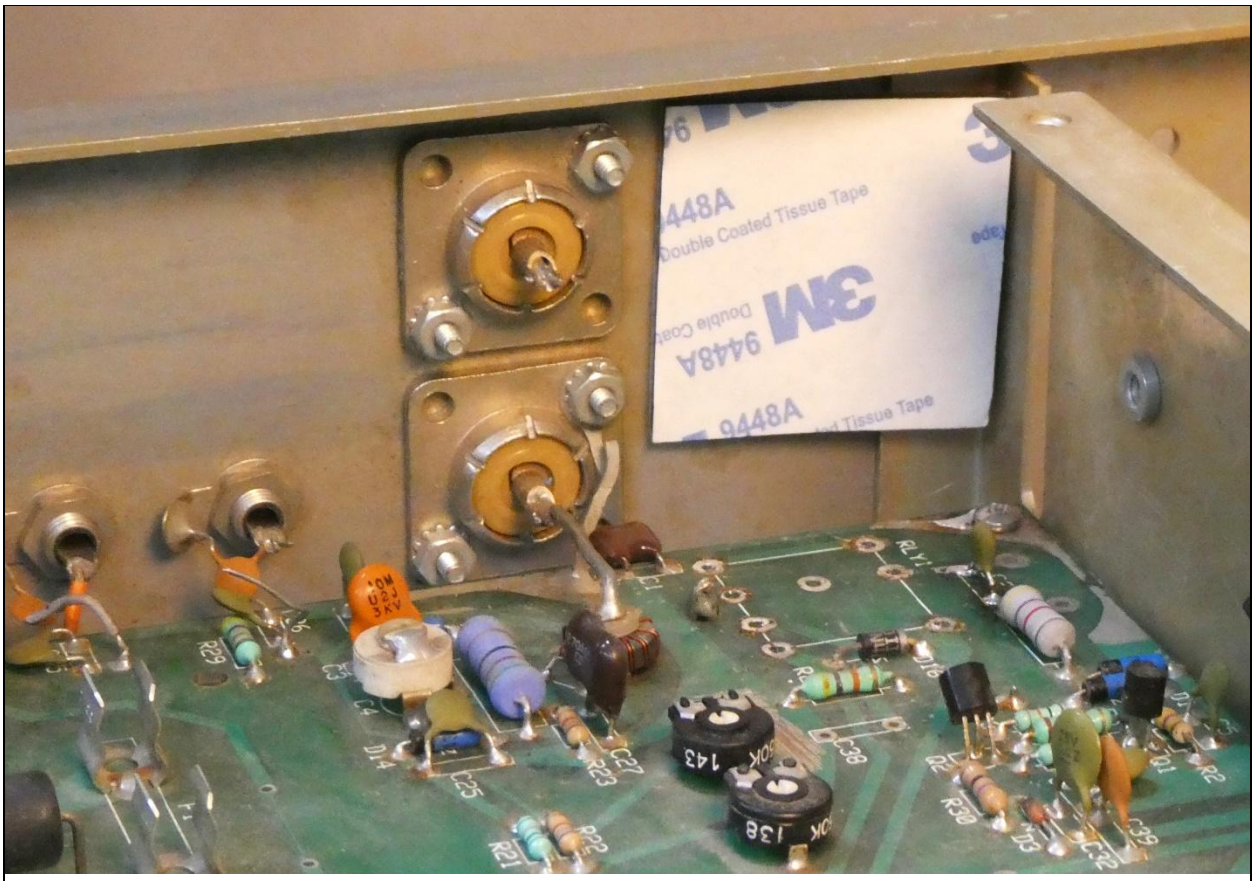


Figure 9 mounting location and tape

The wires and cabinet lid adequately retain the relay board. Make sure the white silicone U channel insulator stays in place. The white soft channel along with a special electronic conformal clear coating shield against noise and accidental short circuits.

Install this tape first and leave the inside area covered for now. Make sure the tape fully covers the center panel screw. The relay board resistor wire must not contact that grounded screw or any metal.

First, wire the long relay wires to their appropriate points on the board. There are alternate connection points if a pad was damaged during relay removal.

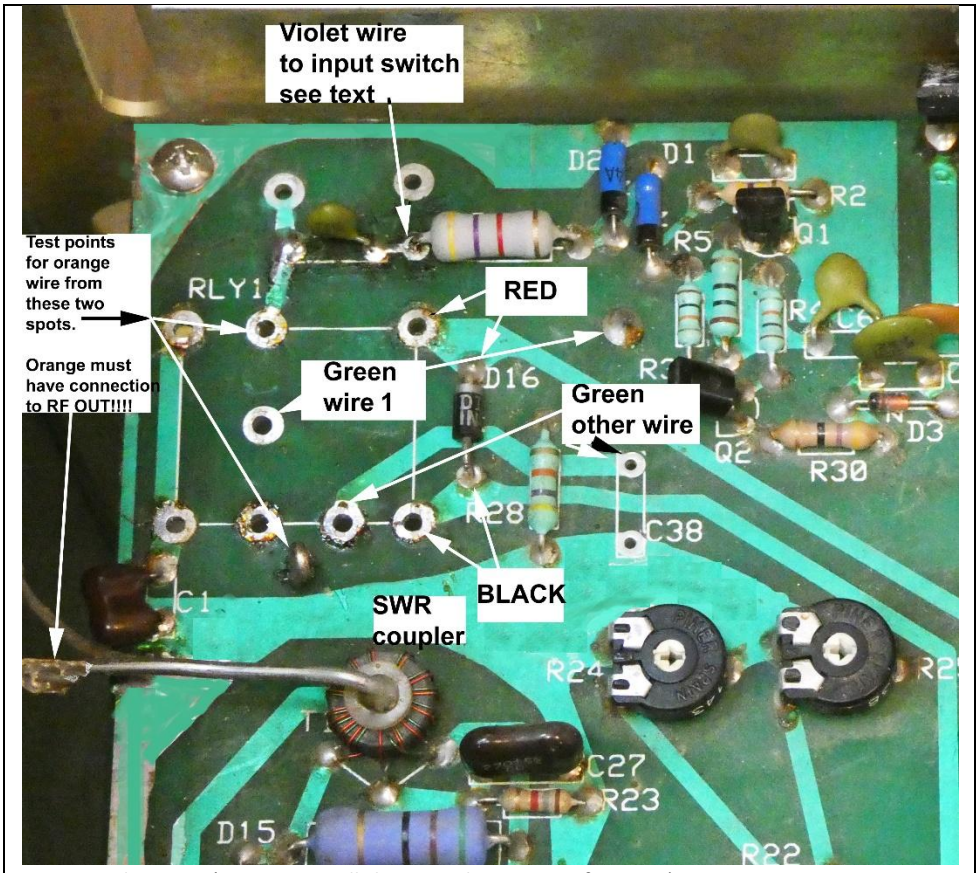


Figure 10 dc wiring (remove C1 still shown in this picture, if it exists)

Figure 10. Low voltage wiring (red, black = coil green, green = bias) is basically the same in all boards. Only the high-power RF signal lead, Orange RF Output, varies between two places. Make sure the Orange from the new relay board goes to the correct spot and has continuity to the “RF OUT” connector center pin. Remove and discard C1, a small reddish mica capacitor, if it exists inside the amplifier. It is shown above. It will not be in every amplifier. It should be virtual open circuit to ground. The RF leads are the shortest and most critical leads.

(The RF leads are connected in a specific order last. The amplifier is tested, and then the very last stage is to optionally affixed this board to the 3M tape. The next page details RF leads.)

The white RF feed wire from the tuned input board on the adjacent side of the center wall is connected second to last. This wire connects to *“amp”* on the relay board as shown in Figure 11 below. This small white wire connects to the empty rectangular pad right next to our heavy white “RF IN” connector wire from the *“rad”* pad. It can route in on either face of the relay system so long as it connects to the correct pad.

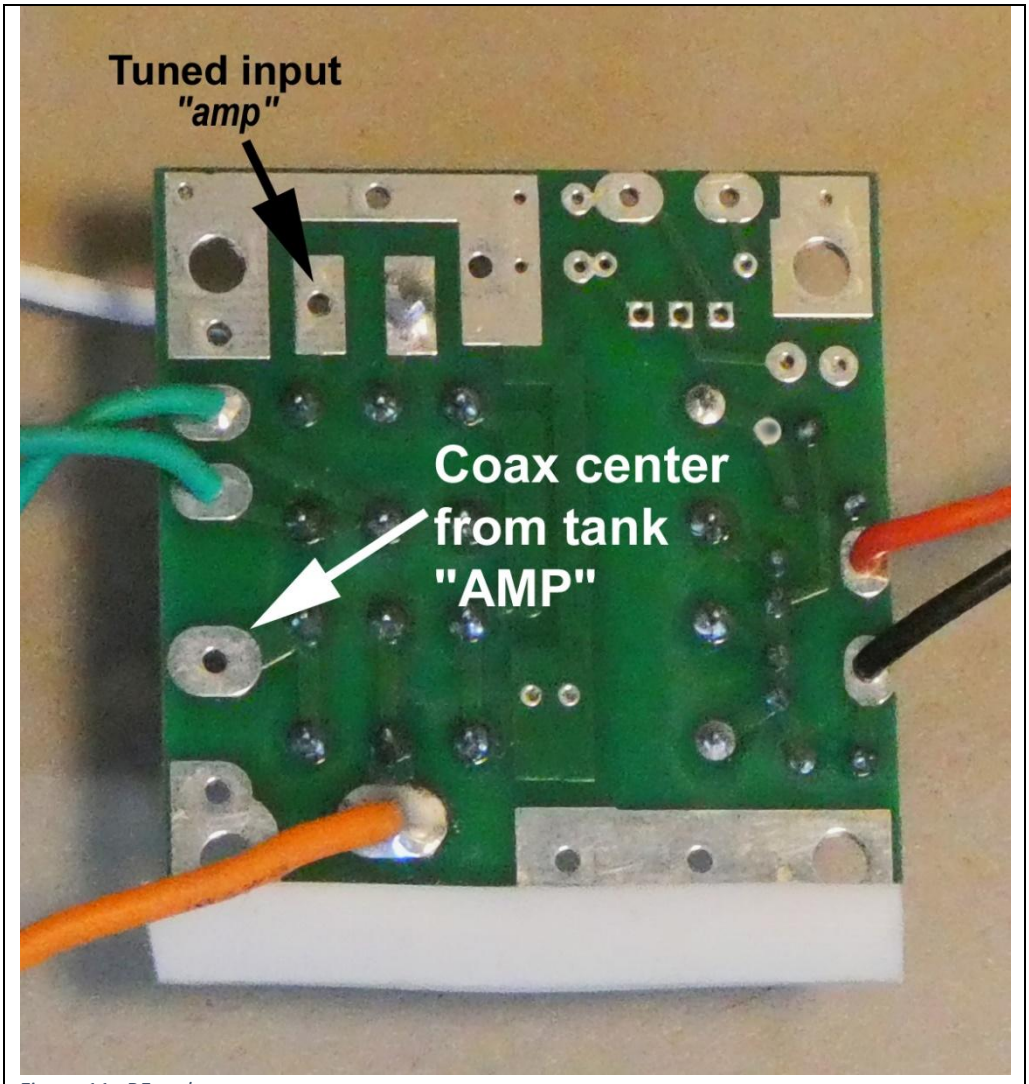


Figure 11 RF pads

The final relay looks like this:

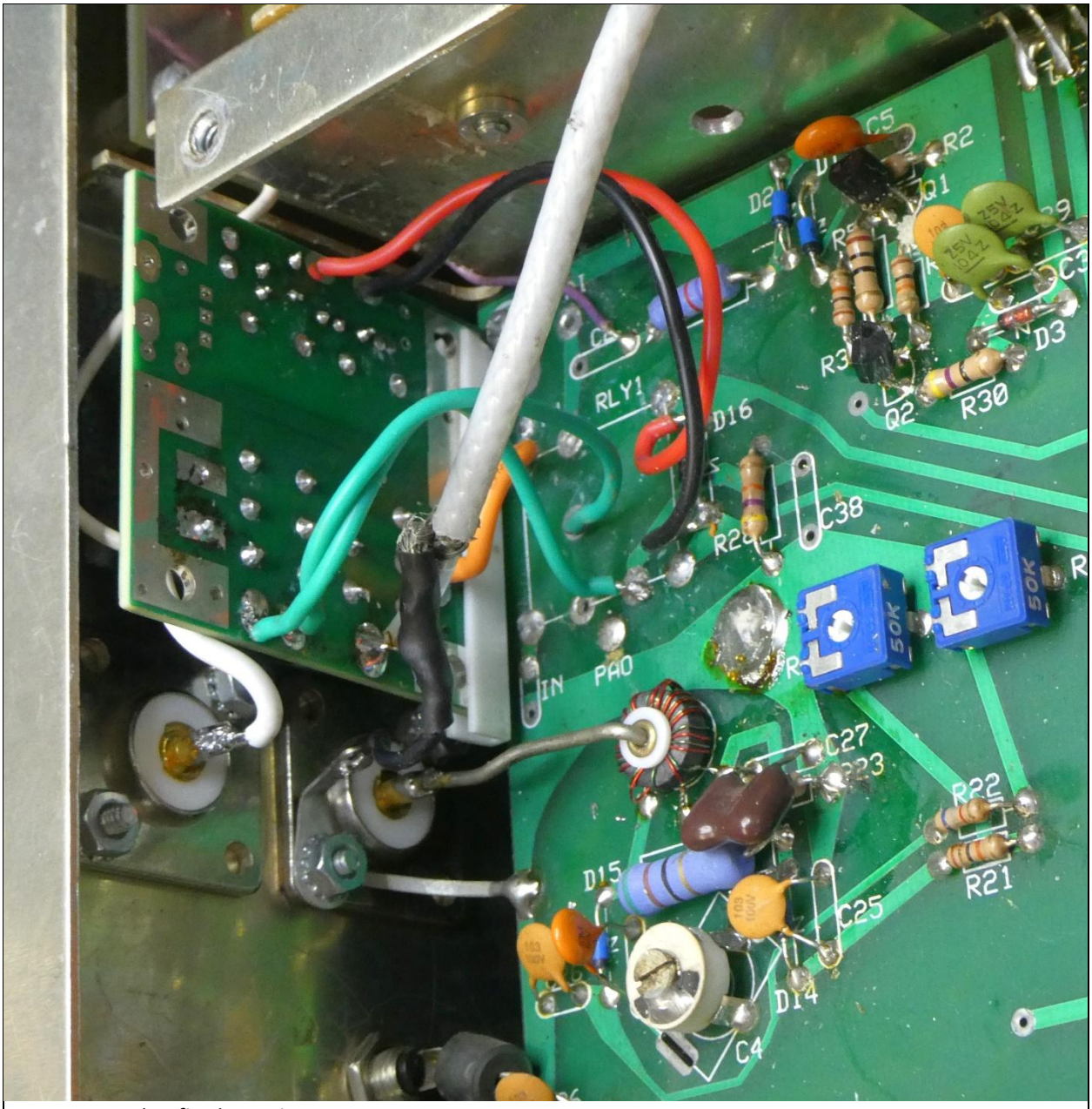


Figure 12 relay final position

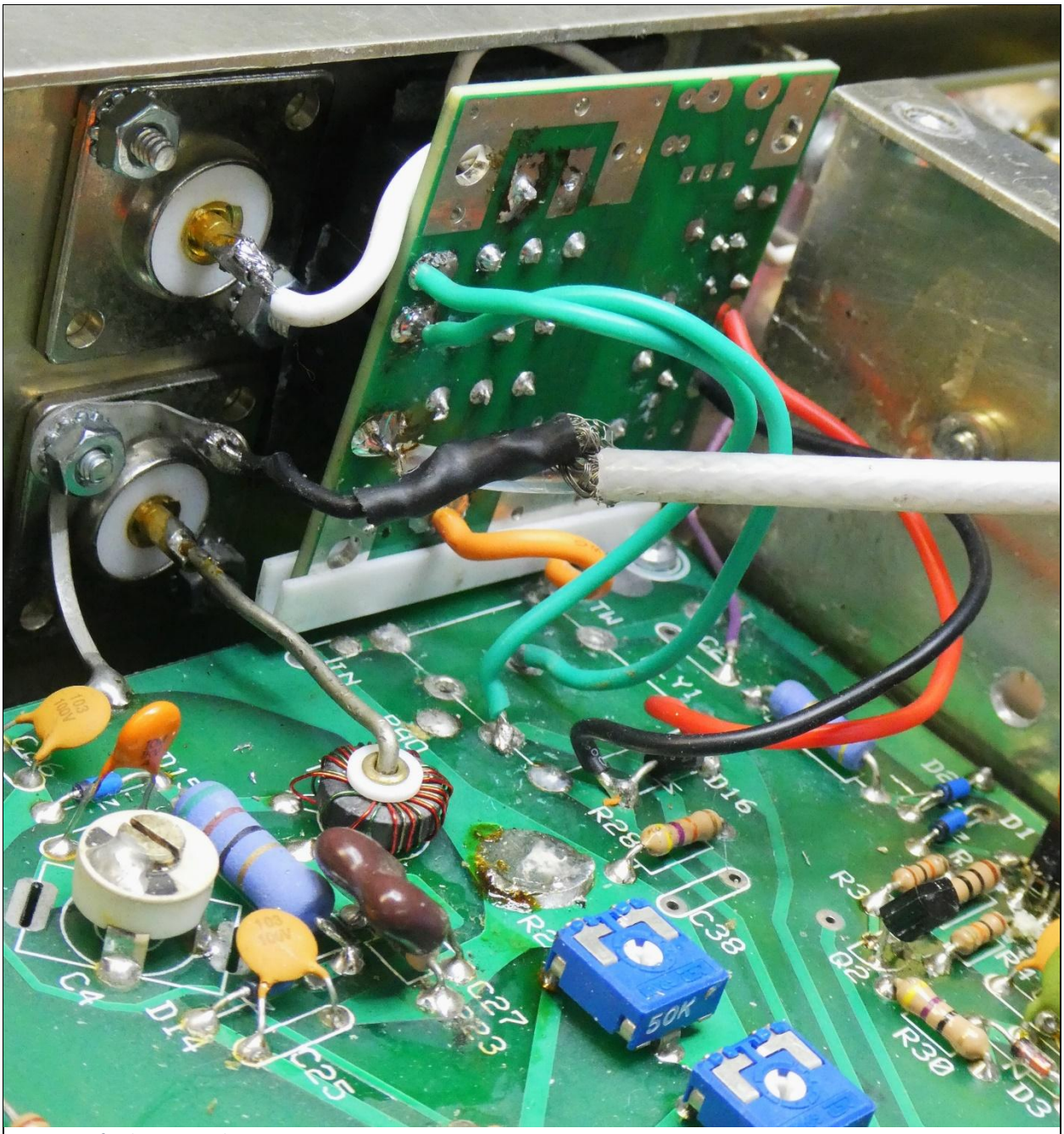


Figure 13 final wiring and position

The coax shield on relocated RF output cable from the tank circuit is grounded to RF OUT mounting screw. We supply a small black wire with lug attached for this. Watch for accidental shorts! The coax center conductor goes to AMP pad. This is the very last cable connected before double checking wiring and testing. Note the violet wire for ABS and capacitor are on the tuned input board. If your amplifier does not have that production mod it should be done. Our AL8X kit mitigates this change.

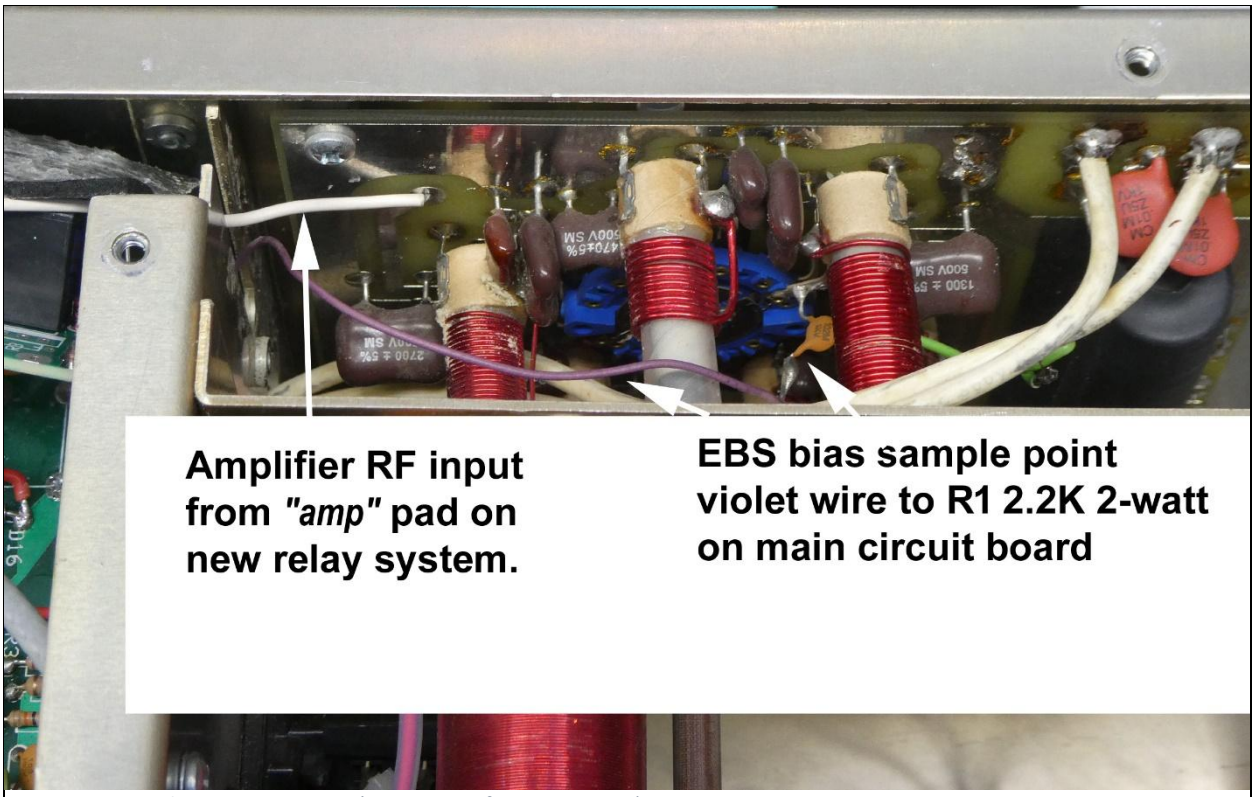


Figure 14 Tuned input connections (pre-existing from Ameritron)

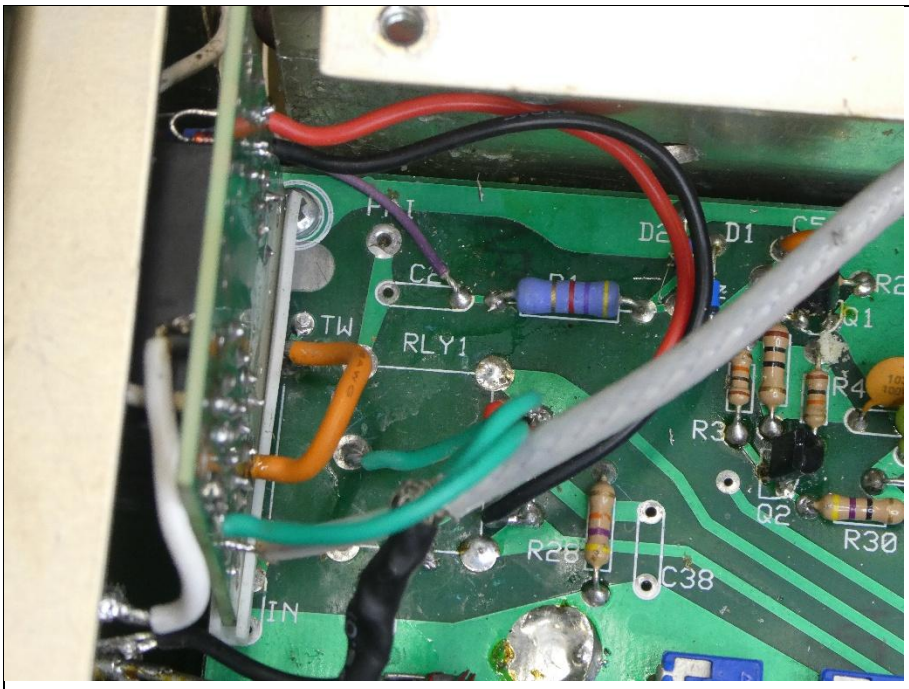


Figure 15 Red and black connected to diode pads

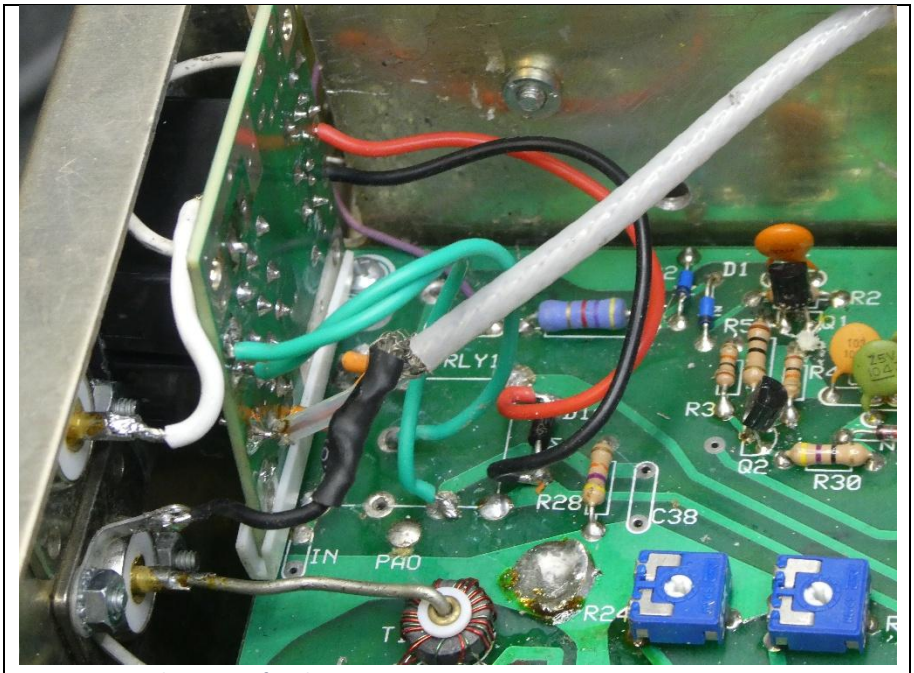


Figure 16 another view of mid-age unit